

IN THE CLAIMS

What is claimed is:

- 1 1. A method of forming contact holes, comprising the steps of:
- 2 forming a first insulating film;
- 3 forming a hole through the first insulating film;
- 4 depositing a titanium layer in an essentially anisotropic manner;
- 5 forming a titanium nitride film;
- 6 forming a tungsten film;
- 7 etching a tungsten film; and
- 8 etching the titanium and tungsten films.
- 1 2. The method of claim 1, wherein:
- 2 depositing a titanium layer in an essentially anisotropic manner
- 3 includes depositing titanium according to method selected from the group
- 4 consisting of an ion metal plasma method, a collimate sputtering method, and
- 5 a long throw sputtering method.
- 1 3. The method of claim 1, wherein:
- 2 forming a contact hole includes forming a contact hole having a width
- 3 no greater than 0.25 μm .

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- 1 4. A method, comprising the steps of:
- 2 anisotropically depositing a first conductive layer over a first
- 3 insulating layer having a contact structure hole formed therein; and
- 4 forming a conductive filling layer over the first conductive layer,
- 5 including within the contact structure hole.
- 1 5. The method of claim 4, wherein:
- 2 depositing the first conductive layer includes an ion metal plasma
- 3 physical deposition method.
- 1 6. The method of claim 5, wherein:
- 2 the ion metal plasma method of deposition includes applying an RF
- 3 power in the range of about 2.0 to 3.5 kilowatts to a chamber coil.
- 1 7. The method of claim 5, wherein:
- 2 the ion metal plasma method of deposition includes applying a DC
- 3 power in the range of 2.0 to 3.0 kilowatts to a target that includes a first
- 4 conductive layer material.
- 1 8. The method of claim 4, wherein:
- 2 depositing a first conductive layer includes a collimate sputtering
- 3 method.

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1 **9.** The method of claim 8, wherein:
2 the collimate sputtering method includes moving sputtering particles
3 through a collimator having an aspect ratio of about 2.

1 **10.** The method of claim 8, wherein:
2 the collimate sputtering method includes applying a DC power in the
3 range of 1.0 to 2.0 kilowatts to a target that includes a first conductive layer
4 material.

1 **11.** The method of claim 4, wherein:
2 depositing a first conductive layer includes a long throw sputtering
3 method.

1 **12.** The method of claim 11, wherein:
2 the long throw sputtering method includes sputtering in sputtering
3 chamber at a pressure no more than 1.0 mTorr.

1 **13.** The method of claim 4, wherein:
2 the first conductive layer comprises titanium.

1 **14.** The method of claim 4, wherein:
2 forming the conductive filling layer includes depositing tungsten with
3 a chemical vapor deposition method.

1 15. The method of claim 4, further including:
 2 etching the conductive filling layer to expose the first conductive
 3 layer.

1 16. The method of claim 15, further including:
 2 etching the first conductive layer to expose the first insulating layer
 3 and forming a plug from the conductive filling layer.

1 17. A method of forming a contact structure, comprising the steps of:
 2 forming a first conducting layer over an insulating layer having a
 3 contact hole formed therein, the first conducting layer having a first thickness
 4 outside the contact hole that is greater than a second thickness on side surfaces
 5 of the contact hole; and
 6 forming a conducting filling layer over the first conducting layer
 7 including within the contact hole.

1 18. The method of claim 17, wherein:
 2 the first conducting layer comprises titanium and the first thickness is
 3 at least 100 nm.

1 19. The method of claim 17, further including:
 2 forming a second conducting layer over the first conducting layer prior

3 to forming the conducting filling layer.

1 20. The method of claim 17, further including:

2 etching the conducting filling layer with an etch having a selectivity

3 between the conducting filling layer and the first conducting layer; and

4 etching the first conducting layer with an etch having a selectivity

5 between the first conducting layer and the conducting filling layer.

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